BLACK BOX®
NETWORK SERVICES

NOVEMBER 2001
ME0001C-10BT
ME0001C-G703
ME0001C-RS530
ME0001C-V24
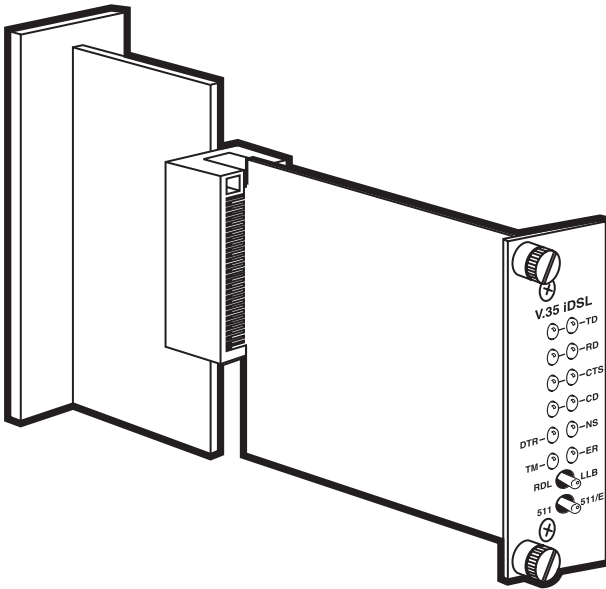**ME0001C-V35**
ME0001C-X21

2-Wire IDSL Line Driver Rack Cards

FEDERAL COMMUNICATIONS COMMISSION
AND
INDUSTRY CANADA
RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

EUROPEAN UNION DECLARATION OF CONFORMITY

This equipment complies with the requirements of the European EMC Directive 89/336/EEC.

$$C\,E$$

NORMAS OFICIALES MEXICANAS (NOM)
ELECTRICAL SAFETY STATEMENT

INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:

   A: El cable de poder o el contacto ha sido dañado; u

   B: Objectos han caído o líquido ha sido derramado dentro del aparato; o

   C: El aparato ha sido expuesto a la lluvia; o

   D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

   E: El aparato ha sido tirado o su cubierta ha sido dañada.

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Contents

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1. Specifications

Transmission Format: Synchronous or asynchronous

Transmission Line: One- or two-pair unconditioned twisted wire

Clocking: Internal, External, or Receive Recover

Table 1-1. Maximum distance for all data rates.

Distance	Cable
10.8 mi (17.4 km)	19 AWG (0.9 mm)
7.2 mi (11.6 km)	22 AWG (0.64 mm)
5 mi (8 km)	24 AWG (0.5 mm)
3.4 mi (5.5 km)	26 AWG (0.4 mm)

Data Rates: Synchronous: 19.2, 32, 56, 64, and 128 kbps; Asynchronous: 0 to 38.4 kbps

Diagnostics: Local Line Loopback, Remote Digital Loopback, V.52-compliant bit error rate pattern generator (511/511E)

Line Interface: Transformer-coupled 1500-VAC isolation

Indicators: LEDs: TD, RD, CTS, CD, DTR, TM, ER, and NS

Connectors: RJ-45 on line side; RJ-45 for 10BASE-T, DB25 female for RS-530 and V.24, M/34 female for V.35, DB15 female for X.21, dual BNC for G.703/G.704

Temperature Tolerance: 32 to 122°F (0 to 50°C)

Humidity: 5 to 95% noncondensing

Size: Front card: 3.1"H x 0.95"W x 4.8"D (7.9 x 2.4 x 12.2 cm); Rear card: 3.3"H x 0.95"W x 2.8"D (8.4 x 2.4 x 7.1 cm)

2. Introduction

2.1 Description

The 2-Wire IDSL Line Driver Rack Card allows synchronous or asynchronous data to be transmitted up to 11 miles (17.7 km) over one or two twisted pair (2- or 4-wire). Supporting synchronous speeds up to 128 kbps and asynchronous speeds up to 38.4 kbps, the Card is perfect for LAN interconnection or high-speed Internet links.

To compensate for poor line quality, the Card supports 2B1Q encoding, automatic equalization, and auto gain control. The Card is fully SNMP manageable using the Managed Micro Rack SNMP/HTTP Card (part number RM261C-SNMP). Software configuration is performed via the VT100™ screens. Swappable interface driver boards and interface cards allow you to easily change applications between 10BASE-T, G.703, RS-530, V.24, V.35, or X.21. The Card also features convenient front-panel diagnostic switches and LEDs that allow for easy setup, configuration, and testing.

The Card is designed to fit into the 16-Port Managed Micro Rack (part number RM260), a 2U-high (3.5") rack chassis. This chassis uses a mid-plane architecture, allowing front cards to be plugged into different rear cards.

2.2 Features

- Synchronous data rates of 19.2, 32, 56, 64, and 128 kbps in all clock modes.

- Asynchronous data rates: Up to 38.4 kbps.

- SNMP manageable using the Managed Micro Rack SNMP/HTTP Card (part number RM261C-SNMP).

- Full-duplex operation over one or two twisted pair (2- or 4-wires).

- Point-to-point distances up to 11 miles (17.7 km).

- Remote digital loopback, local line loopback diagnostics.

- Internal, external, or receive recovered clocking options.

- LED indicators for TD, RD, CTS, CD, DTR, TM, ER, and NS.

- Fits in the Managed Micro Rack (part number RM260), a 2U (3.5") rack chassis.

2.3 SNMP Management

The QuikConnect IDSL Line Driver (ME0009A) is SNMP manageable when connected to a rackmounted 2-Wire IDSL Line Driver Rack Card (ME0001C). SNMP management is enabled through a Managed Micro Rack SNMP/HTTP Card (RM261C-SNMP) located in the 16-Port Managed Micro Rack (RM260).

HTTP/HTMP MANAGEMENT

The SNMP/HTTP Card maintains HTML pages that can be viewed through a Web browser. You can display remote statistics and configure QuikConnect parameters simply by entering the SNMP/HTTP Card's IP address into the browser.
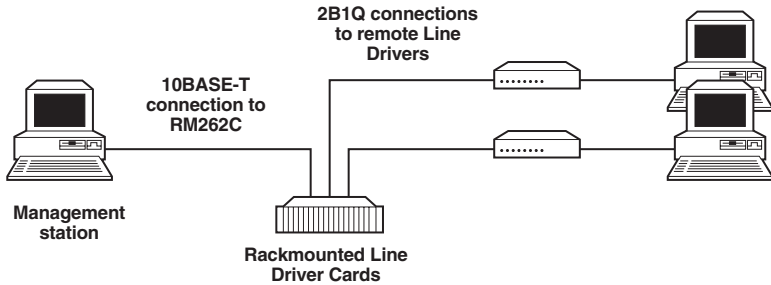
Figure 2-1. Typical application of the Line Driver Card.

3. Configuration

This chapter describes the hardware and software configuration switches and jumpers. Refer to the Managed Micro Rack SNMP/HTTP Card (RM261C-SNMP) users' manual for SNMP options.

3.1 Hardware Setup

The 2-Wire IDSL Line Driver front card defaults to the use of hardware switches for configuration. The front card has an interface driver board, two eight-position DIP switches, and one 4-position DIP switch (see Figure 3-1).
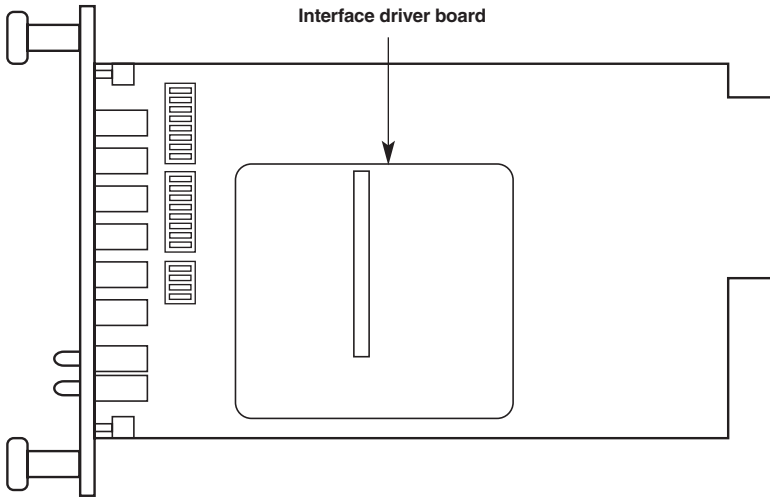
Figure 3-1. Configuration switches and the interface driver board on the front card.

Figure 3-2 shows the orientation of the DIP switches with respect to the ON and OFF positions.
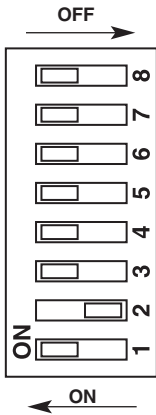
Figure 3-2. Closeup of configuration switches.

NOTE
The ON position is oriented toward the front of the Card.

3.1.1 REVERSIBLE INTERFACE DRIVER BOARD

The 2-Wire IDSL Line Driver Rack Card features switchable interface driver boards that allow a wide range of DTE interface connections. Figure 3-3 shows the interface driver board on the top of the PC board.
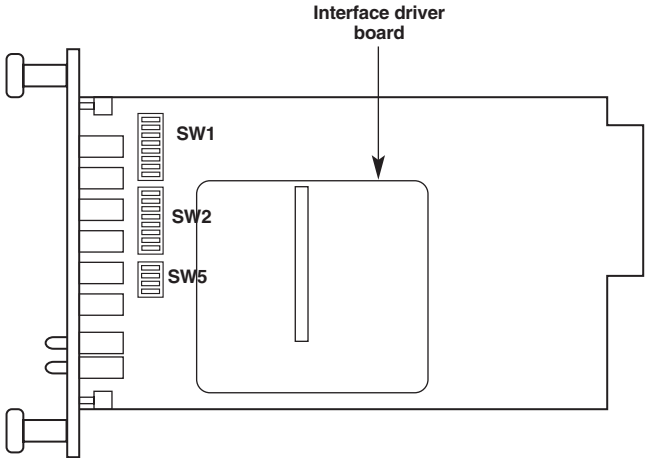
Figure 3-3. Closeup of interface driver board.

Follow the instructions below to select the correct interface for your application:

1. With the 2-Wire IDSL Line Driver Rack Card pulled out of the rack chassis, locate the driver board on the top of the front card.

2. Lift the interface board gently off of the PC board.

3. Locate the correct interface on the bottom of the driver board.   For example, the RS-232/V.35 interface board is marked "THIS SIDE UP FOR RS-232" on one side and "THIS SIDE UP FOR V.35" on the other side.

4. Re-orient the interface board into the socket with the appropriate interface pointed UP and with the arrow pointing toward the front panel of the PC board.

5. Push the interface driver board gently onto the socket and re-install into the rack system.

3.1.2 CONFIGURATION SWITCH S1

The configuration switches on S1 allow you to specify the data rate, async/sync data format, transmit clock source, and response to RDL request. Default settings of S1 are shown in Table 3-1.

Table 3-1. S1 summary.

Position	Function	Factory Default
S1-1	Data Rate	On ⎫
S1-2	Data Rate	Off ⎬ 64K Sync
S1-3	DSR during Local Line Loop	On DSR Enable
S1-4	Reserved	Off ⎫
S1-5	Reserved	Off ⎬ Reserved
S1-6	Tx Clock Source	On ⎫
S1-7	Tx Clock Source	On ⎬ Internal Clock
S1-8	Respond RDL Request	On Enable

Switches S1-1 and S1-2: Data Rate

Use Switches S1-1 and S1-2 with Switch S5-1 to determine the operable sync or async bit rate for the 2-Wire IDSL Line Driver Rack Card. The settings shown in Table 3-2 are the only applicable bit rate settings.

Table 3-2. Bit rate settings: S1-1, S1-2, and S5-1.

S1-1	S1-2	S5-1	Sync Data Rate	Async Data rate
On	On	Off	32 kbps	Reserved
Off	On	Off	56 kbps	Reserved
On	Off	Off	64 kbps	Reserved
Off	Off	Off	128 kbps	0 to 38.4 kbps
On	On	On	Reserved	Reserved
Off	On	On	Reserved	Reserved
On	Off	On	Reserved	Reserved
Off	Off	On	19.2 kbps	Reserved

Switch S1-3: Data Set Ready During Local Line Loopback Test
Use Switch S1-3 to control the behavior of the DSR signal at the EIA interface during the local line loopback test.

Table 3-3. DSR signal at the EIA interface during local line loopback test.

S1-3	Setting	Description
On	Enabled	DSR is on during local line loop (default)
Off	Disabled	DSR is off during local line loop

Switch S1-4: Management Setting

When setting the SNMP management, the DTE rate switches (S1-1, S1-2, and S2-1) need to be in the ON position. Therefore, to set a Rack Card to SNMP management mode, the following switches have to be at the ON position: S1-1, S1-2, S5-1, and S1-4. Use Switch S1-4 to configure the Rack Card's management setting.

S1-4 Setting	Description
On	SNMP management using Netlink management system
Off	Control port management using VT100 control port management

Switch S1-5: Reserved

Switches S1-6 and S1-7: Transmit Clock Source

Use Switches S1-6 and S1-7 to configure the Card for internal, external, or receive recover clock mode.

Table 3-4. Transmit clock source.

S1-6	S1-7	Setting	Description
On	On	Internal	Transmit clock derived internally
Off	On	External	Transmit clock derived from the terminal interface
On	Off	Receive Recover	Transmit clock derived from the received line signal
Off	Off	Hardware Reset	Reset to use hardware switches for configuration.

Switch S1-8: Response to Remote Loop Request

Use Switch S1-8 to allow the Card to enter the Remote Digital Loopback diagnostic test when requested to do so by the far-end modem. For example, when Switch S1-8 is set to "ON," it will enter RDL mode (see **Section 5.2.2**) when requested to do so by the remote modem.

Table 3-5. Remote Digital Loopback Test.

S1-8	Setting
On	Response to RDL request enabled
Off	Response to RDL request disabled

3.1.3 CONFIGURATION SWITCH S2

The 2-Wire IDSL Line Driver Rack Cards may be configured by a menu-driven software system when used with the Managed Micro Rack Control Module, VT100™ (part number RM262C) or Managed Micro Rack SNMP/HTTP Card, SNMP (part number RM261C-SNMP). In order to configure the 2-Wire IDSL Line Driver Rack Card by software commands, you must set its control port address.

The control port address is defined by a two-digit decimal number. Switches S2-1 through S2-4 define the least significant digit or the "ones" digit, and Switches S2-5 through S2-7 define the "tens" digit. Valid addresses are 0 through 79. Use Table 3-6 and the instructions that follow the table to set the control port to the desired address.

Table 3-6. S2 summary.

Address Digit	Switch S2 Settings							
	1	2	3	4	5	6	7	8
Default 0	ON	ON	ON	ON	ON	ON	ON	ON
1	OFF	ON	ON	ON	OFF	ON	ON	ON
2	ON	OFF	ON	ON	ON	OFF	ON	ON
3	OFF	OFF	ON	ON	OFF	OFF	ON	ON
4	ON	ON	OFF	ON	ON	ON	OFF	ON
5	OFF	ON	OFF	ON	OFF	ON	OFF	ON
6	ON	OFF	OFF	ON	ON	OFF	OFF	ON
7	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON
8	ON	ON	ON	ON	N/A/	N/A	N/A	N/A
9	OFF	ON	ON	OFF	N/A	N/A	N/A	ON

Switches S2-1 through S2-4: Control Port Address— LSD

Use Switches S2-1 through S2-4 to set the least-significant digit of the ME0001C control port address. For example, using Table 3-6, if the desired address is "63", the "3" is the least-significant digit in the address. Set Switches S2-1, S2-2, S2-3, and S2-4 to OFF, OFF, ON, ON.

Switches S2-5 through S2-7: Control Port Address—MSD

Use Switches S2-5 through S2-7 to set the most-significant digit of the ME0001C's control port address. For example, using Table 3-6, if the desired address is "62," the "6" is the most-significant digit in the address. Set Switches S2-5, S2-6, and S2-7 to ON, OFF, OFF.

Switch S2-8: Reserved for Factory Use

Switch S2-8 is reserved for factory use and must remain in the ON position.

3.1.4 CONFIGURATION SWITCH S5

The configuration switches on S5 allow you to specify the data rate, 2-wire/4-wire selection, and enable or disable loopback diagnostics. Default settings of S5 are shown in Table 3-7.

Table 3-7. S5 summary.

Position	Function	Factory Default	
S5-1	Data Rate	Off	
S5-2	2-Wire/4-Wire	Off	2-wire
S5-3	Enable LAL or RDL from DTE	On	Enable
S5-4	Enable front-panel switches	Off	Disable

Switch S5-1: Data Rate

Use Switch S5-1 with Switches S1-1 and S1-2 to enable additional data rates. Table 3-2 shows all possible bit rate settings for Switches S1-1, S1-2, and S5-1.

Switch S5-2: 2-Wire/4-Wire

Use Switch S5-2 to configure 2-wire or 4-wire operation.

Table 3-8. 2-wire or 4-wire operation.

S5-2	Setting	Description
Off	2-wire	2-wire operation
On	4-wire	4-wire operation

Switch S5-3: Enable LAL and RDL from DTE

Use Switch S5-3 to enable or disable the Local Analog Loopback and Remote Digital Loopback control from the DTE.

Table 3-9. Enable or disable loopback.

S5-3	Setting	Description
On	Enabled	LAL and RDL enabled
Off	Disabled	LAL and RDL disabled

Switch S5-4: Enable Front-Panel Switches

Use Switch S5-4 to enable or disable the front-panel switches.

Table 3-10. Enable front panel switches.

S5-4	Setting	Description
On	Enabled	Front-panel switches enabled
Off	Disabled	Front-panel switches disabled

3.2 Configure the Software Switches

The 2-Wire IDSL Line Driver Rack Card features a menu-driven command system that allows you to configure the local card. The software control port signals of the ME0001C are carried to each card in the rack along the internal power bus board. Access to all rack card control ports is provided by a single Managed Micro Rack Control Module (see the RM262C users' manual). After setting the control port address (see **Section 3.1.3**), use the following instructions to configure the unit.

1. Connect the serial RS-232 port of a VT100 or similar DTE with terminal emulation to the EIA-561 control port on the Managed Micro Rack Control Module (RM262C). To construct an RS-232 to EIA-561 patch cable, refer to the control port pinout diagram in **Appendix B**.

2. Power up the terminal and set its RS-232 port as follows:

   9600 baud
   8 data bits, 1 stop bit, no parity
   Local echo
   CR-CR/LF on inbound data
   ANSI, VT100 emulation

3. Press [CTRL+B] on the terminal followed by the two-digit control port address.

4. To make a selection from any menu, enter the option number. To exit any menu without making a selection, press the [ESC] key.

5. After the 2-Wire IDSL Line Driver Rack Card is powered on, the control port will send out this message:

   Model: ME0001C software version xx
   Black Box Corporation Copyright © 2000

6. Press [ESC] on the terminal.

7. The 2-Wire IDSL Line Driver Rack Card will then display the Main Menu screen. You may configure the Local Card from this screen.

IMPORTANT!

To make a selection from any menu, enter the option number. To exit any menu without making a selection, or to return to the previous menu, press the [ESC] key.

CONFIGURE THE LOCAL 2-WIRE IDSL LINE DRIVER CARD

To configure the local Card, make a selection from the following Main Menu.

```
          QUIKCONNECT IDSL LINE DRIVER
               LOCAL CONFIGURATION
                    MAIN MENU

 1. DISPLAY ACTIVE CONFIGURATION
 2. DISPLAY HARDWARE CONFIGURATION
 3. DISPLAY SOFTWARE CONFIGURATION
 4. SETUP SOFTWARE CONFIGURATION
 5. SELECT HARDWARE/SOFTWARE CONTROL
 6. DISPLAY MODEM STATUS
 7. TEST MODES
 8. RESTART UNIT


 ENTER YOUR SELECTION (1-8)>
```

Figure 3-4. Main Menu.

Main Menu Option 1: Display Active Configuration

Select Option 1 to display the most-recent configuration of the local 2-Wire IDSL Line (see Figure 3-5). The Card uses the active configuration for its operation. If you make changes to the configuration, you must select Main Menu Option 8. This will update the unit to the new active configuration.

```
*********************************************************
*       ACTIVE CONFIGURATION - Esc to MAIN MENU        *
*                                                       *
* Configuration Control:             Hardware          *
* DTE Rate:                          64 Kbps           *
* Data Format:                       Synchronous       *
* Clock Mode:                        Internal          *
* DSR during Local Line Loop:        Enabled           *
* Response to Remote Digital Loop:   Enabled           *
* DTE controlled Local Line Loop:    Enabled           *
* DTE controlled Remote Digital Loop: Enabled          *
* Control Port Address:              00                *
*********************************************************
```

Figure 3-5. Display active configuration.

Main Menu Option 2: Display Hardware Configuration

Select Option 2 to display the configuration of the hardware DIP switches. To use the Hardware Configuration for the Active Configuration, select Main Menu Option 5. Then select "Use Hardware DIP-Switches." Finally, select Main Menu Option 8 to save.

```
************************************************************
*      HARDWARE CONFIGURATION - Esc to MAIN MENU          *
*                                                          *
* Configuration Control:             Hardware             *
* DTE Rate:                          64 Kbps              *
* Data Format:                       Synchronous          *
* Clock Mode:                        Internal             *
* DSR during Local Line Loop:        Enabled              *
* Response to Remote Digital Loop:   Enabled              *
* DTE controlled Local Line Loop:    Disabled             *
* DTE controlled Remote Digital Loop: Disabled            *
************************************************************
```

Figure 3-6. Display hardware configuration.

Main Menu Option 3: Display Software Configuration

Select Option 3 to display the configuration of the software switches. To use the software configuration for the active configuration, select Main Menu, Option 5. Then select "Use Software Switches." Finally, select Main Menu Option 8 to save.

```
          SOFTWARE CONFIGURATION—Esc to Main Menu

Configuration Control:                 Hardware
DTE Rate:                              64 kbps
Data Format:                           Synchronous
Clock Mode:                            Internal
DSR during Local Line Loop:            Enabled
Response to Remote Digital Loop:       Enabled
DTE controlled Local Line Loop:        Disabled
DTE controlled Remote Digital Loop:    Disabled
```

Figure 3-7. Display software configuration.

Main Menu Option 4: Setup Software Configuration

Select Option 4 to edit the software configuration of the 2-Wire IDSL Line Driver Rack Card. To save changes after editing the software configuration, select Main Menu Option 5, then select "Use Software Switches" and then select Main Menu Option 8 to save.

```
     SOFTWARE CONFIGURATION MENU—Esc to Main Menu

1. DTE Rate
2. Data Format (Async/Sync)
3. Clock Mode
4. DSR during Local Line Loop
5. Response to Remote Digital Loop
6. DTE controlled Local Line Loop
7. DTE controlled Remote Digital Loop
8. 4-Wire/2-Wire selection
```

Figure 3-8. Setup software configuration.

1. DTE Rate

Select Option 1 in the Software Configuration menu to select the synchronous DTE Rate of the 2-Wire IDSL Line Driver Rack Card.

```
       DTE RATE—ESC TO SOFTWARE CONFIG MENU

1. 32 KBPS       3. 64 KBPS (DEFAULT)
2. 56 KBPS       4. 128 KBPS
5. 19.2 KBPS


ENTER YOUR SELECTION (1-5)>
```

Figure 3-9. DTE rate.

2. Data Format

Select Option 2 in the Software Configuration menu to select the sync data format.

```
DATA FORMAT—ESC TO SOFTWARE CONFIG MENU

1. SYNCHRONOUS/ASYNCHRONOUS
```

Figure 3-10. Data format.

3. Clock Mode

Select Option 3 in the Software Configuration menu to select the sync clock mode.

```
*************************************************
* CLOCK MODE - Esc to SOFTWARE CONFIG MENU *
*                                               *
* 1. Master Clock - Internal (default)       *
* 2. Master Clock - External (DTE provided)*
* 3. Slaved to Receive Clock                  *
*************************************************
Enter your selection(1-3)>>
```

Figure 3-11. Clock mode.

Set this option as follows:

Master Clock—Internal: Select Item 1 to use the 2-Wire IDSL Line Driver Rack Card's internal reference clock as the timing source.

Master Clock—External: Select Item 2 to use the DTE-supplied transmit clock.

Slaved to Receive Clock: Select Item 3 to have the 2-Wire IDSL Line Driver Rack Card derive a transmit clock from the incoming data stream.

IMPORTANT!

One Card must be a Master Clock (either internal or external) and the other must be slaved to the Receive Clock.

4. DSR During Local Line Loop

Select Option 4 in the Software Configuration menu to configure the behavior of the local Data Set Ready (DSR) signal during the Local Line Loop test mode.

```
***********************************************
*           DSR DURING LOCAL LINE LOOP        *
*           Esc to SOFTWARE CONFIG MENU       *
*                                             *
* 1. DSR ON during Local Line Loop (default)  *
* 2. DSR OFF during Local Line Loop           *
***********************************************
Enter your selection(1-2)>>
```

Figure 3-12. DSR during local line loop.

5. Response to Remote Digital Loop

Select Option 5 in the Software Configuration menu to instruct the 2-Wire IDSL Line Driver Rack Card to either respond or ignore the Remote Digital Loop request from the remote Card.

```
***********************************************
*    RESPONSE TO REMOTE DIGITAL LOOP          *
*       Esc to SOFTWARE CONFIG MENU           *
*                                             *
* 1. ENABLE (default)        2. DISABLE       *
***********************************************
Enter your selection(1-2)>>
```

Figure 3-13. Response to remote digital loop.

6. DTE Controlled Local Line Loop

Select Option 6 in the Software Configuration menu to instruct the 2-Wire IDSL Line Driver Rack Card to either respond or ignore Local Line Loop requests from the DTE. To instruct the Card to respond to Local Line Loop requests from the DTE, select Enable (Option 1). To instruct the Card to ignore Local Line Loop requests from the DTE interface, select Disable (Option 2).

Figure 3-14. DTE controlled local line loop.

7. DTE Controlled Remote Digital Loop

Select Option 7 in the Software Configuration menu to enable DTE control of the Remote Digital Loop menu. The Remote Digital Loop on the Card can be controlled from the DTE interface by selecting Enable (Option 1). To instruct the Card to ignore this request from the DTE interface, select Disable (Option 2).

Figure 3-15. DTE controlled remote digital loop.

8. 2-Wire/4-Wire Selection

Select Option 8 in the Software Configuration menu to configure 2-Wire or 4-Wire operation.

```
              2-Wire/4-Wire Selection

   1. 4-Wire Mode
   2. 2-Wire Mode

```
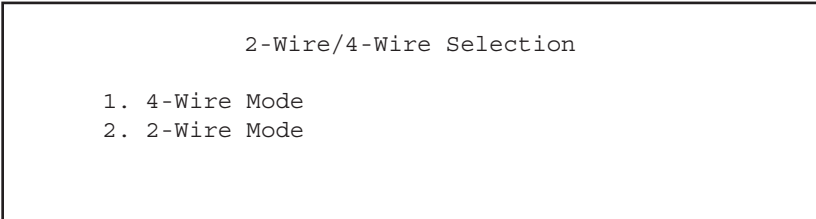
Figure 3-16. 2-Wire/4-Wire selection.

Main Menu Option 5: Select Hardware/Software Control

Option 5 from the Main Menu selects whether the 2-Wire IDSL Line Driver Rack Card will use the hardware switch settings or the software switch settings for its active configuration. If Options 1 or 2 are selected, the Card will use the current hardware or software switch settings as the active configuration. After changing this setting, select Main Menu Option 8 to implement the changes.

Figure 3-17. Hardware/software configuration control.

Main Menu Option 6: Display Modem Status

Select Option 6 from Main Menu to display the Modem Status. Press Return on the keyboard to update and redisplay the screen.

Valid 2-Wire IDSL Line Driver Rack Card Handshake status conditions are listed following Figure 3-18.

```
********************************************************************
*                MODEM STATUS - Esc to TEST MENU                  *
*                                                                 *
* Handshake status:    UNDER TEST                                 *
* Data Terminal Ready: OFF                                        *
* Request To Send:     OFF                                        *
* Carrier Detect:      ON                                         *
* Data Set Ready:      ON                                         *
* Clear To Send:       OFF                                        *
* Test Mode:           Local Line Loop and 511                    *
* 511 Error Count:     4430                                       *
********************************************************************
Enter "C" to clear error count>
```

Figure 3-18. Modem status.

1. Handshaking: This status occurs when the 2-Wire IDSL Line Driver Rack Card is in the process of establishing a link with another Card.

2. Data Mode: This status occurs when the Card successfully establishes a link with another Card, allowing the data to flow.

   Press the space bar to refresh the Modem Status page.

Main Menu Option 7: Test Modes

Select Option 7 from the Main Menu to select the test mode status of the
ME0001C. The 2-Wire IDSL Line Driver test mode settings help to verify the
integrity of the data link and isolate communication difficulties.

```
************************************************
*      TEST MODE MENU - Esc to MAIN MENU      *
*                                             *
* 1. OFF                                       *
* 2. 511                                       *
* 3. 511 w/errors                              *
* 4. Local Line Loop                           *
* 5. Local Line Loop and 511                   *
* 6. Local Line Loop and 511 w/errors          *
* 7. Remote Digital Loop                       *
* 8. Remote Digital Loop and 511               *
* 9. Remote Digital Loop and 511 w/errors      *
************************************************
Enter your selection(1-9)>>
```

Figure 3-19. Test mode menu.

To run or terminate a particular test, key in the option to get to that screen menu.

Test mode options 2, 3, 7, 8, and 9 require the Card to be in data mode with the
remote Card. The Card's test modes are described below:

- OFF: Terminates all tests.

- 511: Initiates the built-in test-pattern generator and detector.

- 511 with Errors: Initiates the built-in test-pattern generator and detector. The
  test-pattern generator also injects intentional errors approximately once per
  second.

- Local Line Loop: Initiates a local line loop. Any data sent to the modem is
  locally returned to its DTE interface.

- Local Line Loop and 511: Initiates the Local Line Loop test and starts the
  internal 511 generator and detector.

- Local Line Loop and 511 w/errors: Initiates the Local Line Loop test and
  starts the internal 511 generator and detector. In this test, the 511 pattern
  generator injects intentional errors into the data stream.

- Remote Digital Loop: Initiates the Remote Digital Loopback test. Any data sent
 to the remote Card is returned to the originating device.

- Remote Digital Loop and 511: Initiates the Remote Digital Loopback test and starts the internal 511 generator and detectors.

- Remote Digital Loop and 511 with errors: Initiates the Remote Digital Loopback test and starts the 511 test patterns. In this test, the 511 pattern generator will inject initial errors into the data stream.

The Modem Status screen is displayed upon initiating a test. Press ESC to return to the Test Mode menu. Press the space bar to refresh the modem status page.

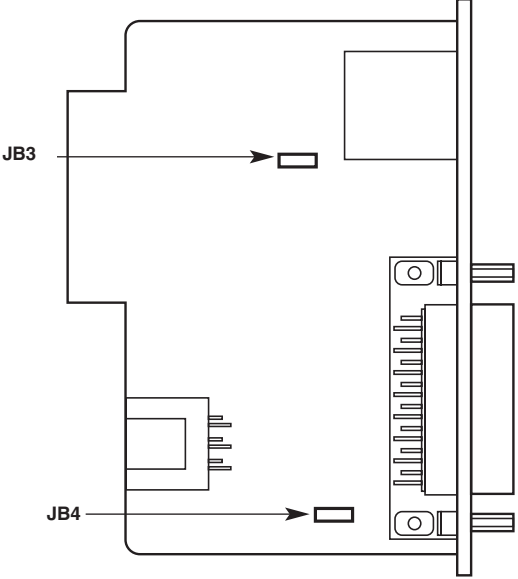## 3.3 Configure the Rear Interface Card

The 2-Wire IDSL Line Driver Rack Card has several interface card options: 10BASE-T, G.703, RS-530, V.24, V.35, and X.21. Each of these options supports one DTE interface connection and one 2-wire/4-wire twisted-pair line connection. Before installation, you will need to examine the rear card to be sure it is properly configured for your application. Each rear card is configured by setting straps located on the PC board. To configure the rear cards, you must set the configuration straps. Figure 3-20 shows the orientation of these straps. Each strap can either be on pegs 1 and 2, or on pegs 2 and 3. **Sections 3.3.1** through **3.3.3** describe the strap locations and possible settings for each rear card.
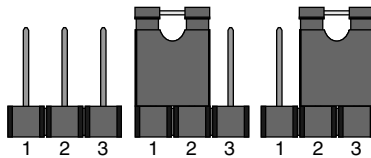
Figure 3-20. Orientation of interface card straps.

3.3.1 DB25/RJ-45 REAR CARD (RS-530 AND V.24) STRAP SETTINGS

Figure 3-21 shows strap locations for the DB25/RJ-45S (RS-530 and V.24) rear cards. These straps determine various grounding characteristics for the terminal interface and twisted-pair lines. JB3 and JB4 are user configurable. JB2 must be set on pegs 1 and 2.

Figure 3-21. DB25/RJ-45 strap locations.

Table 3-11 provides an overview of interface strap functions for the rear interface cards. Following the table overview are detailed descriptions of each strap's function.

Table 3-11. Interface card strap summary.

Strap	Function	Position 1 & 2	Position 2 & 3
JB3	DTE Shield (Pin 1 & FRGND)	Connected*	Open
JB4	SGND & FRGND	Connected*	Open

*Default setting

DTE Shield (DB25 Pin 1) and FRGND (JB3)

In the connected position, this strap links DB25 pin 1 and frame ground. In the open position, pin 1 is disconnected from frame ground.

JB3

Position 1 & 2 = DTE Shield (Pin 1) and FRGND connected

Position 2 & 3 = DTE Shield (Pin 1) and FRGND not connected

SGND and FRGND (JB4)

In the connected position, this strap links DB25 pin 7 (signal ground) and frame ground. In the open position, pin 1 is disconnected from frame ground.

JB4

Position 1 & 2 = SGND (Pin 7) and FRGND connected

Position 2 & 3 = SGND (Pin 7) and FRGND not connected

3.3.2 M/34/RJ-45 REAR CARD (V.35) STRAP SETTINGS

Figure 3-22 shows the strap location for the M/34/RJ-45 (V.35) rear card. This strap determines whether signal ground and frame ground will be connected.
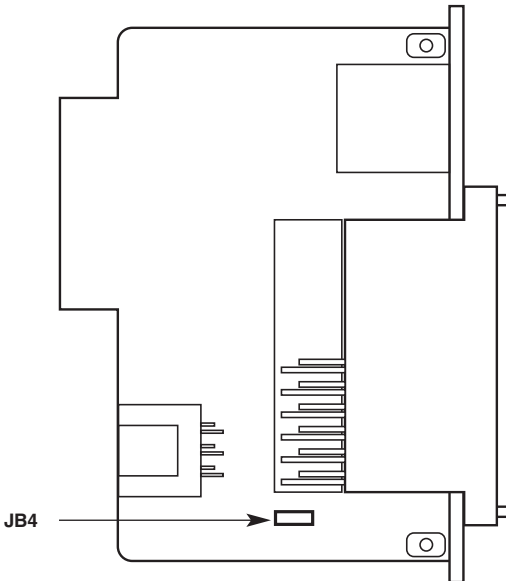

Figure 3-22. M/34/RJ-45 strap locations.

SGND and FRGND (JB4)

In the connected position, this strap links signal ground and frame ground. In the open position, signal ground is disconnected from frame ground.

JB4
Position 1 & 2 = SGND and FRGND Connected*   Position 2 & 3 = SGND and FRGND Not Connected

*Default setting

3.3.3 DB15 REAR CARD (X.21) STRAP SETTINGS

Figure 3-23 shows strap locations for the DB15 (X.21) rear cards. These straps determine various grounding characteristics for the terminal interface and twisted-pair lines. JB3 and JB4 are user configurable.
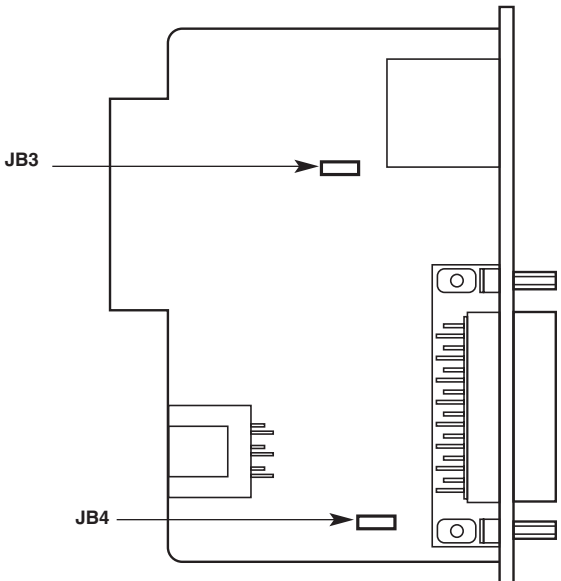
Figure 3-23. Strap locations.

Table 3-11 provides an overview of interface strap functions for the rear interface cards. Following the table overview are detailed descriptions of each strap's function.

Table 3-12. Interface card strap summary.

Strap	Function	Position 1 & 2	Position 2 & 3
JB3 JB4	DTE Shield (Pin 1) and FRGND SGND and FRGND (Pin 8)	Connected* Connected*	Open Open

*Default setting

DTE Shield (DB15 Pin 1) and FRGND (JB3)

In the connected position, this strap links DB15 pin 1 and frame ground. In the open position, pin 1 is disconnected from frame ground.

JB3

Position 1 & 2 = DTE Shield (Pin 1) and FRGND connected
Position 2 & 3 = DTE Shield (Pin 1) and FRGND not connected

---

SGND & FRGND (JB4)

In the connected position, this strap links DB15 pin 8 (Signal Ground) and frame ground through a 100-ohm resistor. In the open position, pin 8 is connected directly to frame ground.

JB4

Position 1 & 2 = SGND (Pin 8) and FRGND connected through a 100-ohm resistor
Position 2 & 3 = SGND (Pin 8) and FRGND directly connected

Installing the X.21 Daughterboard onto the X.21 Line Driver Card

Figure 3-24 shows the X.21 daughterboard, DCE/DTE selector, and jumper (JP1) location with respect to the rack card. Following Figure 3-24 are guidelines for the installation of the X.21 daughterboard, setting for DCE/DTE, and a brief description of Jumper JP1.
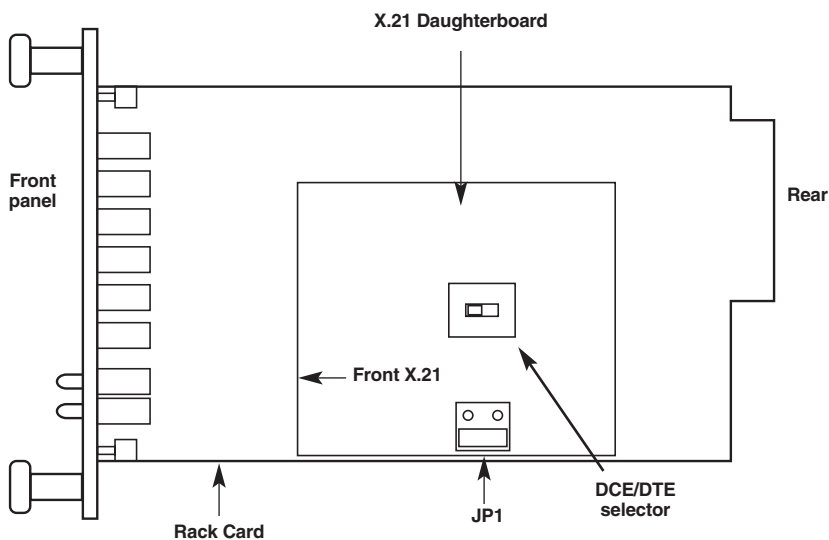
Figure 3-24. View of the X.21 daughterboard, DCE/DTE selector, and JP1.

Follow the steps below for proper installation of the X.21 daughterboard.

WARNING

The X.21 daughterboard connector is not keyed and can be installed incorrectly.

1. On the top side of the X.21 daughterboard, locate the designator shown below:

   ◄——— **Front X.21**

2. Install the X.21 daughterboard onto the front card with the "Front X.21" arrow pointing to the front panel of the rack card (see Figure 3-24).

DCE/DTE Selector for the X.21 Daughterboard

The X.21 daughterboard can be set up as a DCE (default) or DTE device. The DCE/DTE selector must be installed in the X.21 daughterboard for any configuration. The following information describes the setting for DCE/DTE.

- DCE setting (default): To set a rack card as a DCE device, install the DCE/DTE selector with the DCE arrows pointing toward the front panel.

- DTE setting: To set a rack card as a DTE device, install the DCE/DTE selector with the DTE arrows pointing toward the front panel.

Jumper (JP1) Setting

The X.21 daughterboard operates at speeds up to 2.3 Mbps. When using the daughterboard at data rates of 2 Mbps or higher, clocking issues may introduce bit errors. Bit errors can also occur when long cables are used to interconnect the modem to an X.21 terminal device (router, multiplexor, etc.). To solve bit error problems due to speed and/or long cables, the X.21 daughterboard is equipped with a jumper selector (JP1) that changes the sampling edge of the transmit clock. Refer to Figure 3-24 for jumper JP1 location.

The following is a brief description of JP1 setting and function.

- Normal setting: The jumper shorts the two outer pins of JP1. Figure 3-24 shows the default position. This position is selected when operating at low data rate (less than 2 Mbps) and using a short X.21 terminal cable.

- Invert setting: The jumper shorts the two inner pins of JP1. This setting is selected when operating at data rates of 2 Mbps or higher or when using long X.21 terminal cables.

NOTE

The G.703 Rear Card module is covered in Appendix D. The 10BASE-T Ethernet Rear Card module is covered in Appendix E.

4. Installation

This chapter describes the functions of the 16-Port Managed Micro Rack (RM260) chassis, tells how to install front and rear 2-Wire IDSL Line Driver Rack Cards into the chassis, and how to connect to the twisted-pair interface and the serial interface.

4.1 The Rack Chassis

The 16-Port Managed Micro Rack Chassis (Figure 4-1) has 16 card slots plus its own power supply. Measuring only 3.5" high, the Rack Chassis is designed to occupy only 2U in a 19" rack. Sturdy front handles allow the Rack Chassis to be extracted and transported conveniently.
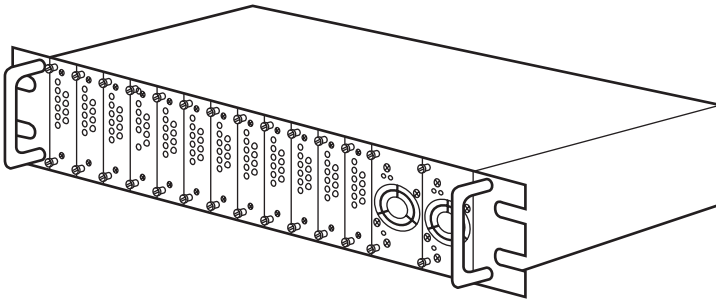

Figure 4-1. The Rack chassis with power supply.

THE RACK POWER SUPPLY

The power supply included in the Managed Micro Rack uses the same mid-plane architecture as the modem cards. The front card of the power supply slides in from the front, and the rear card slides in from the rear. They plug into one another in the middle of the rack. The front card is then secured by thumbscrews, the rear card by conventional metal screws.

WARNING

There are no user-serviceable parts in the power-supply section of the Managed Micro Rack Chassis. Only qualified service personnel should change the voltage settings and replace the fuses. Contact Black Box Technical Support at 724-746-5500 for more information.

4.2 Installing the Card into the Chassis

The 2-Wire IDSL Line Driver Rack Card is comprised of a front card and a rear card. The two cards meet inside the rack chassis and plug into each other via mating 50-pin card-edge connectors. Use the following steps as a guideline for installing each Card into the rack chassis:

1. Slide the rear card into the back of the chassis along the metal rails provided.

2. Secure the rear card using the metal screws provided.

3. Slide the front card into the front of the chassis. It should meet the rear card when it's almost all the way into the chassis.

4. Push the front card gently into the card-edge receptacle of the rear card. It should "click" into place.

5. Secure the front card using the thumb screws.

4.3 Wiring the Card

Each of the rear interface cards compatible with the 2-Wire IDSL Line Driver Rack Cards has one terminal interface port and one 2-wire/4-wire (twisted-pair) port. For specific interface pinouts, refer to the diagrams in the **Appendix C** of this manual.

4.3.1 CONNECT TO A **DTE DEVICE**

Regardless of the interface module you choose, the Card's serial port is always wired as a DCE. It plugs into a DTE such as a terminal, PC, or host. When making the connection to your DTE device, use a straight-through cable of the shortest possible length that is appropriate to the interface you are using. When purchasing or constructing an interface cable, please refer to the pin diagrams in **Appendix C** as a guide.

4.3.2 CONNECT TO A **DCE DEVICE**

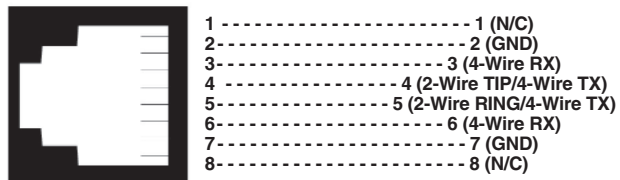Since the 2-Wire IDSL Line Driver Rack Card's serial port is always wired as a DCE, you must use a null-modem cable when connecting to another DCE device such as a CSU/DSU, modem, or multiplexor. This cable should be of the shortest possible length that is appropriate to the interface you are using. When purchasing or constructing a null-modem interface cable, use the pin diagrams in **Appendix C** as a guide.

4.3.3 CONNECT THE TWISTED-PAIR INTERFACE

The 2-Wire IDSL Line Driver Rack Card supports communication between two DTE devices at distances to 5 miles (8 km) over 24-AWG (0.5-mm) twisted-pair wire. There are two essential requirements for installing the Card:

1. These units work in pairs. Both units at the end of the twisted pair must have the same two-wire/four-wire setting. For instance, if you are operating in two-wire mode, both units must be in the two-wire setting. Similarly, if you are operating in four-wire mode, both units must be in the four-wire setting.

2. To function properly, the Card needs one or two twisted pairs of metallic wire. This twisted pair must be unconditioned, dry, metallic wire, between 19 (0.9 mm) and 26 AWG (0.4 mm); the higher-number gauges may limit distance somewhat. Standard dialup telephone circuits, leased circuits that run through signal equalization equipment, or standard, flat modular telephone-type cable are not acceptable.

   The RJ-45 connector on the 2-Wire IDSL Line Driver Rack Card's twisted-pair interface is polarity insensitive and is wired for a two-wire interface. The signal/pin relationships are shown in Figure 4-2.


```
1 ----------------------- 1 (N/C)
2 ----------------------- 2 (GND)
3 --------------------- 3 (4-Wire RX)
4 ----------------- 4 (2-Wire TIP/4-Wire TX)
5 --------------- 5 (2-Wire RING/4-Wire TX)
6 --------------------- 6 (4-Wire RX)
7 ----------------------- 7 (GND)
8 ----------------------- 8 (N/C)
```

Figure 4-2. Twisted-pair line interface.

3. Proper 2-wire pairing between the two Line Drivers is as follows:

Signal	Pin #	Pin #	Signal
Tip	4 ----------------- 4		Tip
Ring	5 ----------------- 5		Ring

5. Operation

Once the 2-Wire IDSL Line Driver Rack Card is properly configured and installed, it should operate transparently. This chapter describes functions of the LED status indicators and the use of the built-in loopback test modes.

5.1 LED Status Indicators

The 2-Wire IDSL Line Driver Rack Card features twelve front-panel LEDs that monitor power, the DTE signals, network connection, and test modes. Figure 5-1 shows the location of each LED. Following Figure 5-1 is a description of each LED function.
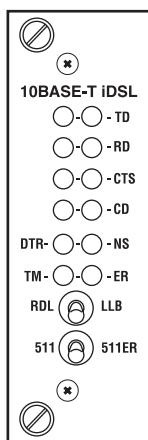
Figure 5-1. Front-panel LEDs.

- TD and RD glow yellow to indicate an idle condition of Binary "1" data on the respective terminal interface signals. Green indicates Binary "0" data.

- CTS consists of two LEDs (one yellow, one green). CTS glows green to indicate that the Clear to Send signal from the modem is active. Yellow indicates inactive CTS.

- CD consists of two LEDs (one yellow, one green). CD glows yellow if no carrier signal is being received from the remote modem. Green indicates that the remote modem's carrier is being received.

- DTR glows green to indicate that the Data Terminal Ready signal from the terminal is active.

- ER glows red to indicate the likelihood of a bit error in the received signal. During the 511 or 511E test, ER flashes to indicate that the test-pattern detector has detected a bit error.

- TM glows yellow to indicate that the Card has been placed in test mode. The unit can be placed in test mode by the local user or by the remote user.

- NS (No Signal) glows red to indicate that the local Card has not yet connected with the remote Card.

5.2 Test Modes

The 2-Wire IDSL Line Driver Rack Card offers two proprietary loopback test modes, plus a built-in V.52 BER test-pattern generator, to evaluate the condition of the modems and the communication link. These tests can be activated physically from the front panel or via the interface.

5.2.1 LOCAL LINE LOOPBACK (LLB)

The Local Line Loopback (LLB) test checks the operation of the local Card and is performed separately on each unit. Any data sent to the local Card in this test mode will be echoed (returned) back to the user device (see Figure 5-2). For example, characters typed on the keyboard of a terminal will appear on the terminal screen.

LLB initiated
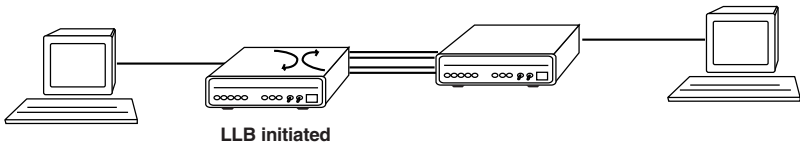
Figure 5-2. Local line loopback.

To perform an LLB test, follow these steps:

1. Activate LLB. This may be done in one of three ways:

   a) Move the front-panel toggle switch to the right to "Local."

   b) Raise the LLB signal on the interface (see **Appendix C**).

   c) Set local loop from the VT100 screen.

Once LLB is activated, the Card's transmitter output is connected to its own receiver. Data is also looped back to the line. The TM LED should be lit.

2. Verify that the data terminal equipment is operating properly and can be used for a test.

3. Perform a V.52 BER (bit error rate) test as described in **Section 5.2.3**. If the BER test equipment indicates no faults but the data terminal indicates a fault, follow the manufacturer's checkout procedures for the data terminal. Also, check the interface cable between the terminal and the Card.

5.2.2 REMOTE DIGITAL LOOPBACK (RDL)

The Remote Digital Loopback (RDL) test checks the performance of both the local and remote Cards and the communication link between them. Any characters sent to the remote Card in this test mode will be returned back to the originating device (see Figure 5-3). For example, characters typed on the keyboard of the local terminal will appear on the local terminal screen after having been passed to the remote Card and looped back.
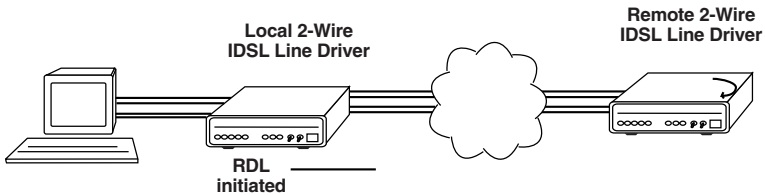
Figure 5-3. Remote digital loop.

IMPORTANT

Do not send a 511 test pattern from the test equipment when you connect external test equipment to the 2-WIre IDSL Line Driver Rack Card.

To perform an RDL test, follow these steps:

1. Activate RDL. This may be done in three ways:

   a) Move the front-panel toggle switch to the left to "Remote."

   b) Raise the RDL signal on the interface (see **Appendix C**).

   c) Set remote loopback from the VT100 screen.

2. Perform a V.52 BER test as described in **Section 5.2.3**. If the BER test equipment indicates a fault and the local line loopback test was successful for both Cards, you may have a problem with the twisted-pair line between the modems. You should then check the twisted-pair line for proper connections and continuity.

5.2.3 V.52 (BER) TEST-PATTERN GENERATOR

To use the V.52 BER tests in conjunction with the Remote Digital Loopback tests (or with local line loopback tests), follow these instructions:

1. Locate the 511/511E toggle switch on the Card's front panel and move it to the left. This activates the V.52 BER test mode and transmits a 511 test pattern into the loop. If any errors are present, the local modem's red ER LED will blink sporadically.

2. If the above test indicates no errors are present, move the V.52 toggle switch to the right, activating the 511E test with errors present. If the test is working properly, the local modem's red ER LED will blink approximately once per second. A successful 511E test will confirm that the link is in place and that the Card's built-in 511 generator and detector are working properly.

Appendix A. Terminal Interface Pin Assignments

Table A-1. M/34 female connector—DCE (V.35 interface).

Pin #	Signal
B	SGND (Signal Ground)
C	RTS (Request to Send)
D	CTS (Clear to Send)
E	DSR (Data Set Ready)
F	CD (Carrier Detect)
H	DTR (Data Terminal Ready)
L	LLB (Local Line Loop)
N	RDL (Remote Digital Loop)
P	TD (Transmit Data)
R	RD (Receive Data)
S	TD/ (Transmit Data-B)
T	RD/ (Receive Data-B)
U	XTC (External Transmit Clock)
V	RC (Receive Timing)
W	XTC/ (External Transmit Clock)
X	RC/ (Receive Timing)
Y	TC (Transmit Timing-A)
AA	TC/ (Transmit Timing-B)

Table A-2. DB25 female connector—DCE (RS-232 interface).

Pin #	Signal
1	FC (Frame Ground)
2	TD (Transmit Data)
3	RD (Receive Data)
4	RTS (Request to Send)
5	CTS (Clear to Send)
6	DSR (Data Send Ready)
7	SGND (Signal Ground)
15	TC (Transmit Timing-A)
17	RC (Receive Timing)
18	LLB (Local Line Loop)
20	DTR (Data Terminal Ready)
21	RDL (Remote Digital Loop)
24	XTC (External Transmit Clock)

Table A-3. G.703, RJ-45 interface.

Pin Number	G.703 Network Signal
1	1 (RX+)
2	2 (RX-)
3	3 (Not connected)
4	4 (TX-)
5	5 (TX+)
6	6 (Not connected)
7	7 (Not connected)
8	8 (Not connected)

Table A-4. 10BASE-T Ethernet interface, RJ-45 female connector.

Pin	Signal
1	1 (RX+)
2	2 (RX-)
3	3 (Not connected)
4	4 (TX-)
5	5 (TX+)
6	6 (Not connected)
7	7 (Not connected)
8	8 (Not connected)

**Table A-5. X.21 interface pin description,
DB15 female connector (DTE/DCE configuration).**

Pin #   Interface

 1- Frame Ground
 2- T (Transmit Data-A)
 3- C (Control-A)
 4- R (Receive Data-A)
 5- I (Indication-A)
 6- S (Signal Element Timing-A)
 7- BT (Byte Timing-A, Not Used)
 8- SGND (Signal Ground)
 9- T/ (Transmit Data-B)
10- C/ (Control-B)
11- R/ (Receive Data-B)
12- I/ (Indication-B)
13- S/ (Signal Element Timing-B)
14- BT/ (Byte Timing-B, Not Used)

Appendix B. Control Port Pin Assignment (RJ-45 Connector on RM262C Card)

Pin Function   **RJ-45 Pin Number**

Transmit Data (from DTE)...............................7
Receive Data (to DTE)....................................6
Ground..5

Appendix C. Line Interface Pin Assignment (RJ-45 Connector)

Pin Number	Signal
1	N/C (No Connection)
2	N/C (No Connection)
3	4 Wire Tip
4	Tip
5	Ring
6	4 Wire Ring
7	N/C (No Connection)
8	N/C (No Connection)

Appendix D. G.703 Rear Card Module

D.1 Description

The G.703 Rear Card Module provides IDSL Line Drivers and Rack Cards with an interface to the G.703 PCM network. With the G.703 Rear Card Module, you can achieve high-speed G.703 network extension, dedicated high-speed Internet access, or remote LAN access. Supporting 64-kbps clear channel or 128-kbps octet mode data streams, the Module can set its own clock or take clocking from the G.703 network.

The Module meets line driver function cards in the mid-plane of the RM260 chassis. G.703 access is via a 120-ohm RJ-45 jack. 2- or 4-wire twisted-pair line connections are made via a second RJ-45 jack.

The Module features on-board transformer isolation and surge protection as well as compliance with ITU-T G.823 jitter control specifications.

D.2 Typical Application

The G.703 Module allows a remotely connected LAN or high-speed application to connect to the 64k/G.703 (PCM) network through a pair of Line Drivers. Figure D-1 shows a typical application.
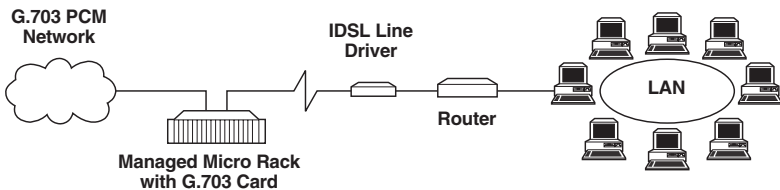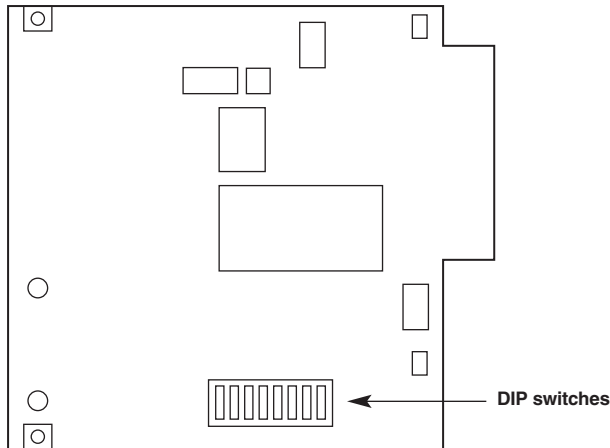

Figure D-1. Typical application.

D.3 DIP-Switch Configuration

The module features an eight-position DIP switch mounted on the rear of the printed circuit board. Use these switches to configure G.703 operational and timing modes. Figure D-2 shows the position of the DIP switches on the board.

Figure D-2. DIP switches on the rear card.

Switch S1: Reserved for future use

Switch S1 is reserved for future use and should remain in the Off position.

Switch S2: Operation Mode

Use switch S2 to set the rear card module for either clear channel or octet timing mode. Most installations use clear channel (64-kbps) mode operation, though some installations may use octet timing mode.

When operating in octet timing mode, the G.703 Rear Card facilitates a sense of frame synchronization by inserting bipolar violations in the AMI coding structure. When the Card is set to octet timing mode (On position), all communications equipment in the channel must be configured to communicate at 128 kbps (64 kbps data plus 64 kbps octet framing pattern). Additionally, all terminal equipment must support octet timing. When set to clear channel mode, the system operates at 64 kbps.

Table D-1. Operation mode.

S2	Setting
Off On	Clear Channel Mode Octet Timing Mode

Switch S3: Timing Mode

The setting of Switch S3 determines the source of the system timing. The system timing may be provided by:

1. the G.703 network, or

2. the local function card or remote baseband line driver/CSU/DSU (either a rackmountable function card or standalone unit).

Set Switch S3 to Network timing when only one of the two connected baseband line drivers or CSU/DSUs employ a 64 k/G.703 interface card (the other line driver connects to a V.35, EIA-232, etc. device).

Set Switch S3 to Modem timing when both of the connected baseband line drivers or CSU/DSUs employ a 64 k/G.703 interface card. In this application, one G.703 interface card must be set to Modem timing, and the other must be set to Network timing.

Switches S4 and S5: Reserved for future use

Switches S4 and S5 are reserved for future use and should remain in the Off position.

Switch S6: Operation Mode

In some cases, you must include bi-polar violations in the AMI structure when operating in clear channel (64 kbps) mode. This is determined by communications or terminal equipment external to the Card. Use Switch S6 to configure the unit to transmit G.703 data to the network with or without BPVs.

Table D-2. Operation mode.

S6	Setting
On	No BPVs
Off	Injected BPVs

Switches S7 and S8: Reserved for future use

Switches S7 and S8 are reserved for future use and should remain in the Off position.

D.4 Installing the Rear Card and Front Function Card

See **Section 4.2**.

D.5 Making Interface Connections

The module provides access to a 64-kbps co-directional G.703 PCM network. Figure D-3 shows the position of the G.703 interface and the line interface of the G.703 rear card. This section describes how to connect the G.703 interface and the line interface.

NOTE

The G.703 line surge protection on this unit was installed for circuit protection only. By no means does this include the preservation of signal quality during a large surge.
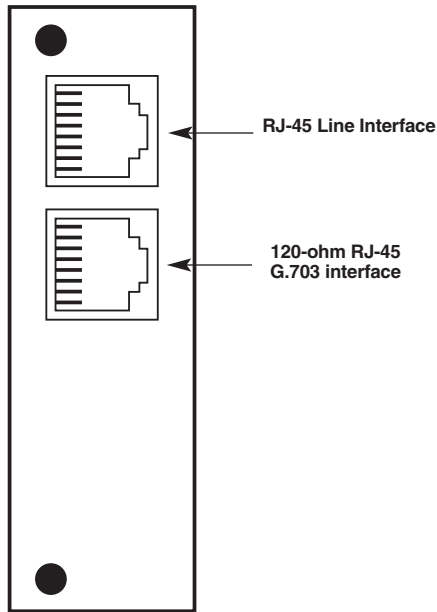

RJ-45 Line Interface

120-ohm RJ-45 G.703 interface

Figure D-3. Interface ports.

D.5.1 CONNECTING TO A G.703 PCM NETWORK CHANNEL

The 120-ohm RJ-45 port on a G.703 rear card is pre-wired for direct connection to the G.703 PCM network. Connect the RJ-45 jack provided by your digital service carrier to the 120-ohm G.703 interface on the card using a straight-through twisted-pair cable between 19 and 26 AWG (0.4 mm to 0.9 mm, inversely). To be sure you have the correct wiring, refer to Figure D-4
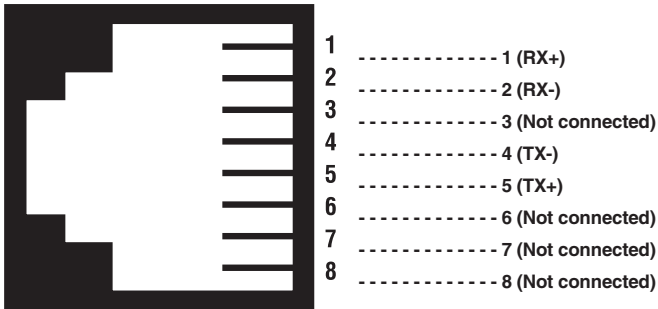

Figure D-4. 120-ohm RJ-45 G.703 interface.

D.5.2 CONNECTING THE LINE INTERFACE

Two essential requirements for connecting the line interface on the G.703 rear card include:

1. These units work in pairs. Both units at the end of the twisted pair must have the proper 2-wire/4-wire setting. For instance, if you are operating in 2-wire mode, both units must be in the 2-wire setting.

2. To function properly, the Card needs one or two twisted pairs of metallic wire. The twisted pairs must be unconditioned, dry, metallic wire, between 19 (0.9 mm) and 26 AWG (0.4 mm). Standard dialup telephone circuits, or leased circuits that run through signal-equalization equipment, or standard flat modular telephone-type cable are not acceptable. Figure D-5 shows the pin/signal relationships of the line interface port.
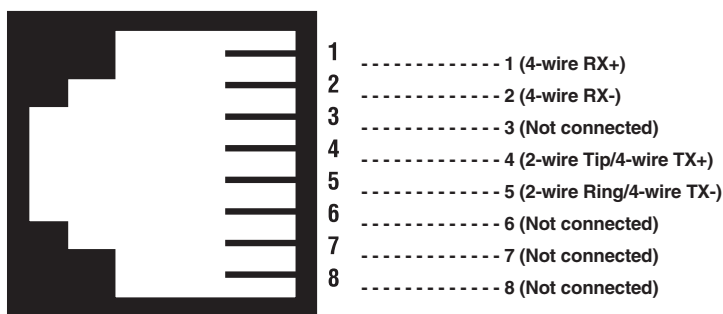
Figure D-5. RJ-45 line interface.

D.5.3 TWO-WIRE CABLE CONNECTION VIA RJ-45

The line interface port on the Card's twisted-pair interface is polarity insensitive and is wired for a two-wire interface. Proper two-wire pairing between the two line drivers is shown in Table D-3.

Table D-3. 2-wire pairing.

Signal	Pin #	Pin #	Signal
Tip	4- 4		Tip
Ring	5- 5		Ring

NOTE

The pin designations shown above are to be used when connecting to another Line Driver or other similarly pinned line interface on a rear card.

NOTE

Any G.703 or line interface cable connected to the G.703 card must be shielded cable, and the outer shield must be 360-degree bonded—at both ends—to a metal or metalized backshell.

Appendix E. 10BASE-T Ethernet Bridge Module

E.1 Description

The Ethernet Bridge Module installs in the Managed Micro Rack system to provide seamless Ethernet LAN extension. The Module bridges two physically separate Ethernet LANs at the MAC level. Operation of the Module is transparent to higher network level protocols such as TCP/IP, DECnet™, NetBIOS®, and IPX™. The Ethernet Bridge Module is 802.3 compliant and supports PPP (RFC 1661) with Bridging Control Protocol (RFC 1638).

Once installed in the local Managed Micro Rack, the Ethernet Bridge Module works in a plug-and-play manner to forward LAN broadcasts, multicasts, and frames destined for the peered Ethernet LAN at the remote end (the base unit at the remote end must be equipped with an Ethernet Bridge module). Using the Ethernet Bridge Module, peered Ethernet LANs can be linked over leased 2-wire/4-wire, DDS, PCM, and campus fiber circuits.

The Ethernet Bridge Module plugs directly into the rear of a Rack Card Line Driver (ME0001C or ME0004C). The Bridge Modules must be used in pairs. Figure E-1 shows a typical installation.
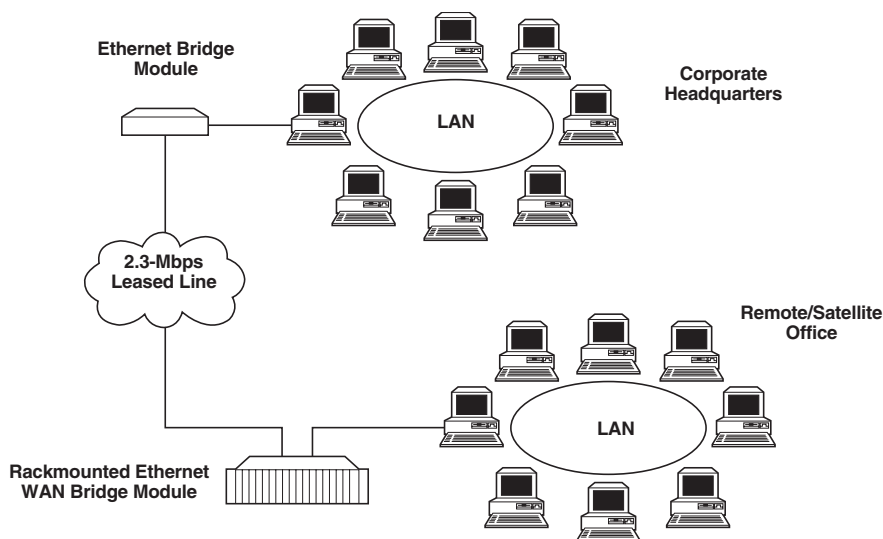

Figure E-1. Typical application.

E.2 Configuration

The 10BASE-T Ethernet Rear Card Module plugs into the ME0001C and ME0004C Line Drivers to provide Ethernet LAN extension. The Ethernet Card has no switches or jumpers and does not need to be configured. However, factors such as the type of medium, throughput across the link, and clocking mode must be determined by the settings of the baseband Line Drivers (ME0001C and ME0004C).

1. Bit rate: The DTE rate setting of your base unit corresponds with the throughput of your Ethernet Bridge Module. Use higher speeds to allow maximum throughput to your extended LAN. Use lower speeds to limit the access of your extended LAN.

NOTE
The Ethernet Bridge Module only supports synchronous speeds.

2. Clocking mode: Set the clocking modes on the base units so that one unit is configured for internal clocking mode and the other unit is set for receive recover clocking mode.

Table E-1. Base unit clock modes.

| Unit A	Unit B
Internal clock setting	Receive recover clock setting

NOTE
Unit A and B are chosen arbitrarily. It does not matter which unit is A and which is B.

3. When using the Ethernet Bridge Module, disable the Enable Loop from DTE switch on the front function card (ME0003C or ME0004C).

4. All other base settings depend upon your application and on the application medium (twisted-pair or coaxial cable).

E.3 Connecting the Interface Driver Board

Included in your 10BASE-T Ethernet Bridge Module package is an interface driver board that allows you to configure your front function card for Ethernet operation. Figure E-2 shows the interface driver board connected to a ME0003C or ME0004C front function card.
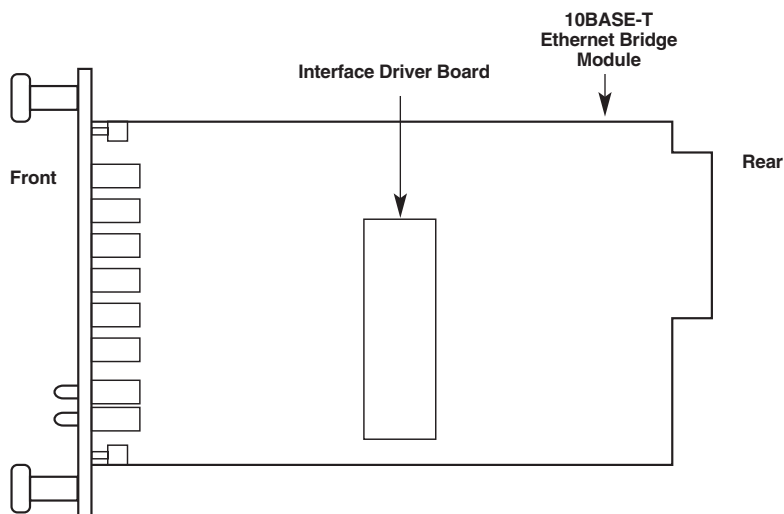
Figure E-2. Interface driver board mounted on a ME0003C or ME0004C front card.

Follow the instructions below to connect the interface driver board to the front function card.

1. With the function card pulled out of the Managed Micro Rack, locate the driver board to be replaced on the top of the base unit front card.

2. Lift the old interface board gently off the printed circuit board.

3. Position the Interface Driver Board on top of the function card's PC board with the sockets oriented toward the male pins. Be sure that the label marked

   $\longleftarrow$ FRONT

   is pointed toward the front of the function card (toward the LEDs).

4. Push the Interface Driver Board gently onto the socket and re-install the function card into the rack.

E.4 Installing the Rear Interface Card and the Front Function Card

See **Section 4.2**.

E.5 Connecting to the 10BASE-T Ethernet Port

The 10BASE-T Ethernet Rear Card module provides line side connections through an RJ-45 connector. Figure E-3 shows the rear panel and the locations of the connectors.
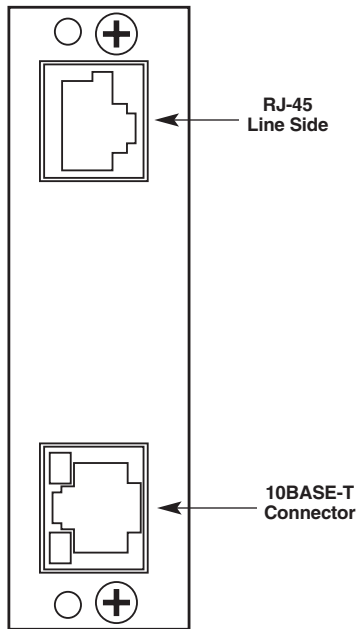
Figure E-3. Rear-panel RJ-45 connectors.

The RJ-45 Ethernet port on the rear card connects directly to a 10BASE-T network. Figure E-4 shows the 10BASE-T RJ-45 port pin description. You may make connections up to 330 feet (100 m) using Type 4 or 5 cable.

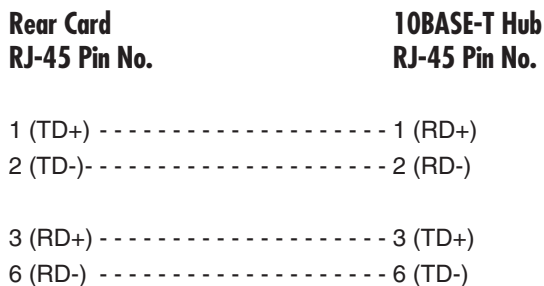|		
1	- - - - - - - - - - - - - - - 1	TD+ (data output from ME0001C)
2	- - - - - - - - - - - - - - - 2	TD- (data output from ME0001C)
3	- - - - - - - - - - - - - - - 3	RD+ (data input to ME0001C)
4	- - - - - - - - - - - - - - 4	Not connected
5	- - - - - - - - - - - - - - 5	Not connected
6	- - - - - - - - - - - - - - - 6	RD - (data input to ME0001C)
7	- - - - - - - - - - - - - - 7	Not connected
8	- - - - - - - - - - - - - - 8	Not connected
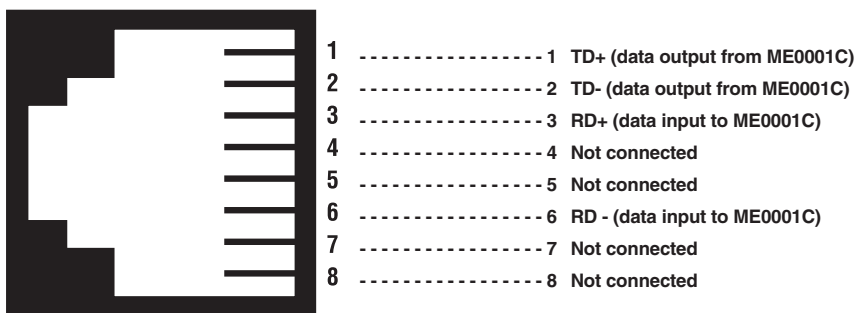
Figure E-4. Ethernet connector pinout.

E.5.1 CONNECTING THE 10BASE-T ETHERNET PORT TO A HUB

The 10BASE-T Ethernet rear card's 10BASE-T interface is configured as a DTE (Data Terminal Equipment), just like a 10BASE-T network interface card in a PC. Therefore, it expects to connect to a 10BASE-T hub using a straight-through RJ-45 cable. Use Figure E-5 to construct a cable to connect the rear card to a 10BASE-T hub.

Rear Card   **10BASE-T Hub**
RJ-45 Pin No.   **RJ-45 Pin No.**

1 (TD+) - - - - - - - - - - - - - - - - - - 1 (RD+)
2 (TD-)- - - - - - - - - - - - - - - - - - 2 (RD-)

3 (RD+) - - - - - - - - - - - - - - - - - - 3 (TD+)
6 (RD-) - - - - - - - - - - - - - - - - - - 6 (TD-)
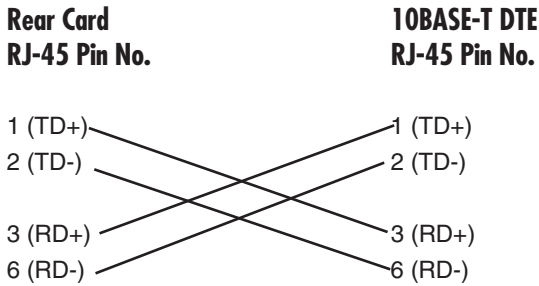
Figure E-5. Straight-through cabling.

E.5.2 CONNECTING THE 10BASE-T ETHERNET PORT TO A PC (DTE)

The rear card interface is configured as DTE (Data Terminal Equipment). If you want to connect the rear card to another DTE device such as a 10BASE-T network interface card in a PC, you must construct a 10BASE-T crossover cable as shown in Figure E-6.

Rear Card
RJ-45 Pin No.
                                    10BASE-T DTE
                                    RJ-45 Pin No.

1 (TD+)   1 (TD+)
2 (TD-)   2 (TD-)

3 (RD+)   3 (RD+)
6 (RD-)   6 (RD-)

Figure E-6. Crossover cabling.

E.5.3 CONNECTING THE LINE INTERFACE

The 10BASE-T Ethernet rear card must be used with a front function card. There are two essential requirements for connecting the line interface on the rear card.

1. These units work in pairs with one rear card connected to another rear card over 2- or 4-wire twisted pair (2- or 4-wire operation is determined by the front function card).

2. To function properly, the rear card needs one or two twisted pairs of metallic wire (2- or 4-wire). The twisted pairs must be unconditioned, dry, metallic wire, between 19 (0.9 mm) and 26 AWG (0.4 mm). Standard dialup telephone circuits that run through signal-equalization equipment, or standard, flat modular telephone-type cable are *not* acceptable. See Figure E-7.
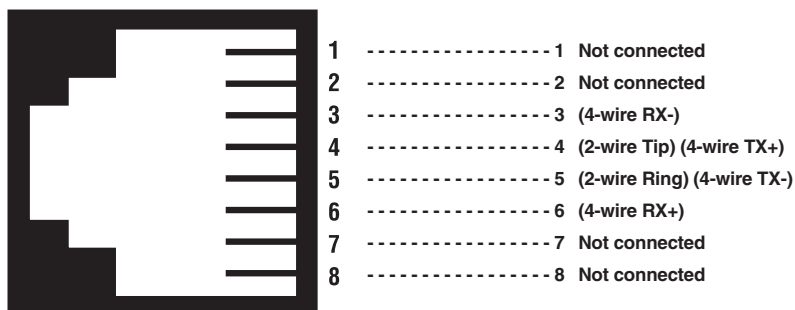
Pin		Function
1	- - - - - - - - - - - - - - - 1	Not connected
2	- - - - - - - - - - - - - - - 2	Not connected
3	- - - - - - - - - - - - - - - 3	(4-wire RX-)
4	- - - - - - - - - - - - - - - 4	(2-wire Tip) (4-wire TX+)
5	- - - - - - - - - - - - - - - 5	(2-wire Ring) (4-wire TX-)
6	- - - - - - - - - - - - - - - 6	(4-wire RX+)
7	- - - - - - - - - - - - - - - 7	Not connected
8	- - - - - - - - - - - - - - - 8	Not connected

Figure E-7. RJ-45 line interface.

NOTE
Two-wire line drivers use RJ-45 pins 4 and 5.

E.6 Operation

In order to operate, the rear card must be connected to a front function card and installed in the rack unit. It also requires a 10BASE-T connection. After power is applied, the rear card automatically starts performing the bridging function without additional user intervention. MAC addresses discovered are automatically loaded into the MAC address table. They are automatically deleted from the MAC address table if they experience an inactivity of 8 minutes.

E.6.1 POWER-UP

The rear card is hot-swappable. It receives power from the rack power bus. Therefore, it is powered up as soon as it is plugged into the rack and the rack power supply is turned on.

E.6.2 LED STATUS INDICATORS

The 10BASE-T Ethernet rear card features two LEDs that monitor general operating status and the 10BASE-T twisted-pair link integrity. Figure E-8 shows the LEDs located directly beneath the RJ-45 jack. Following Figure E-8 is a description of each LED's function.

Status LED (Yellow)

Link Integrity LED (Green)
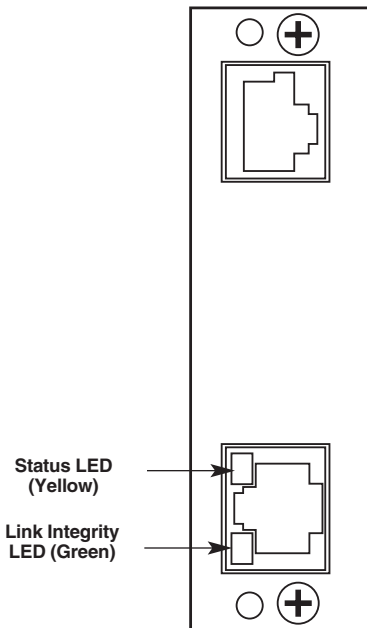
Figure E-8. 10BASE-T Ethernet Rear Card LED locations.

• Status: Blinks yellow from one to eleven times to indicate system status. Each pulse pattern is separated by a 2-second "off" period. Greater pulse patterns have higher priority (buffer saturation has greater priority than an empty MAC table). Valid system statuses are:

1 pulse	= system status OK
2 pulses	= no MAC entries in the MAC address table
3 pulses	= Clear to Send (CTS) or Carrier Detect (CD) from base unit are not asserted
4 pulses	= Rear card buffer is saturated
5 pulses	= WAN receive frame(s) too large
6 pulses	= WN receive frame(s) not Octet aligned

7 pulses	= WAN receive frame(s) aborted
8 pulses	= Detected WAN receive frame(s) with bad CRC
9 pulses	= Detected LAN receive frame(s) too large
10 pulses	= Detected LAN receive frame(s) not Octet aligned
11 pulses	= Detected LAN receive frame(s) with bad CRC

After a status code is displayed eight times and the associated condition is removed, the status code will no longer appear.

• Link: Glows green to indicate good link integrity on the 10BASE-T twisted-pair line.

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